

# IBM “MXT” Memory eXtension Technology



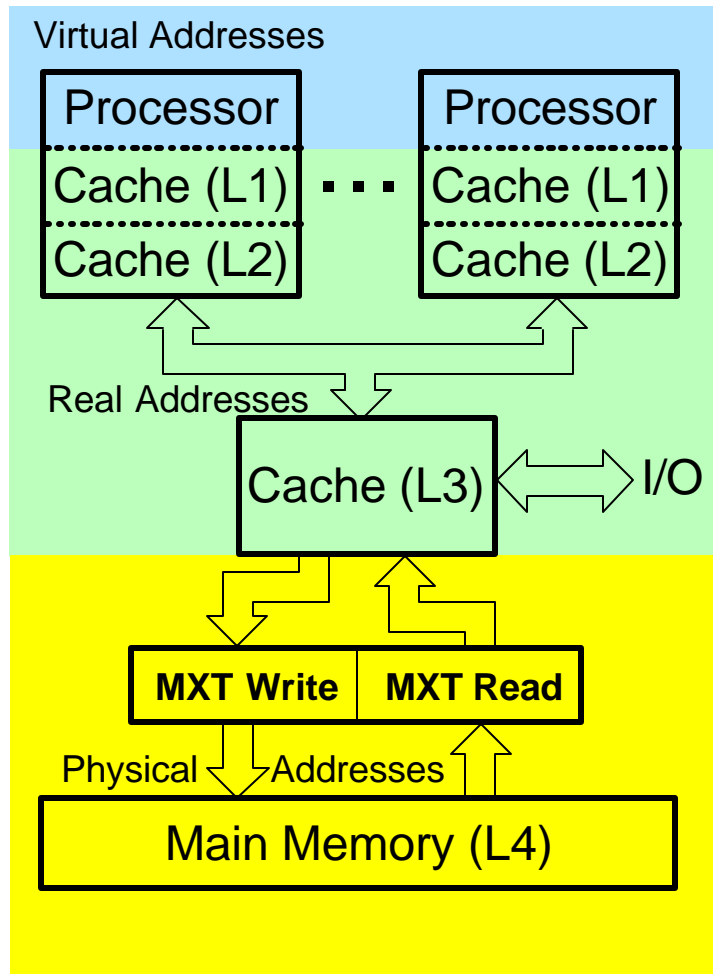
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# Memory eXtension Technology (MXT)

## System Architecture

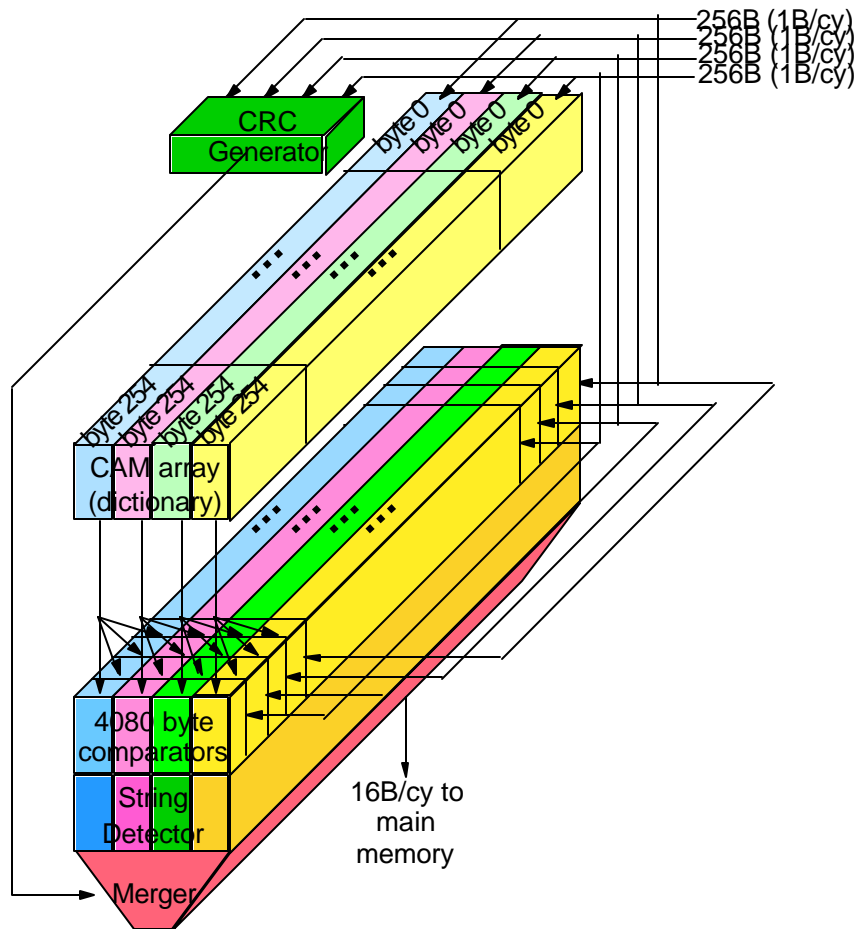


- **2-Level main memory architecture (L3/L4)**
  - Fast SDRAM L3 Cache (25% - 40% faster (lower latency) than main memory)
  - L3 Cache Miss Rate < 5% (Typically 2%)
  - High Function L4 Main Memory (MXT Subsystem, Online Maintenance, Remote/Very Large Memory)
  - Function Costs Approximately \$50 - \$60
- **Architectural optimization around contemporary technologies**
  - 0.25 micron and smaller CMOS
  - Low-Cost high-Density packaging
  - DDR SDRAM
- **Cost and performance competitive single chip memory controller for the high volume server and work station market.**
  - First of its kind to employ real-time MXT to effectively double usable memory
  - MXT stores all but most recently accessed data in special format which reduces redundant character patterns



# Memory eXtension Technology (MXT)

## Write Engine Logic

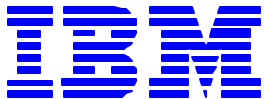
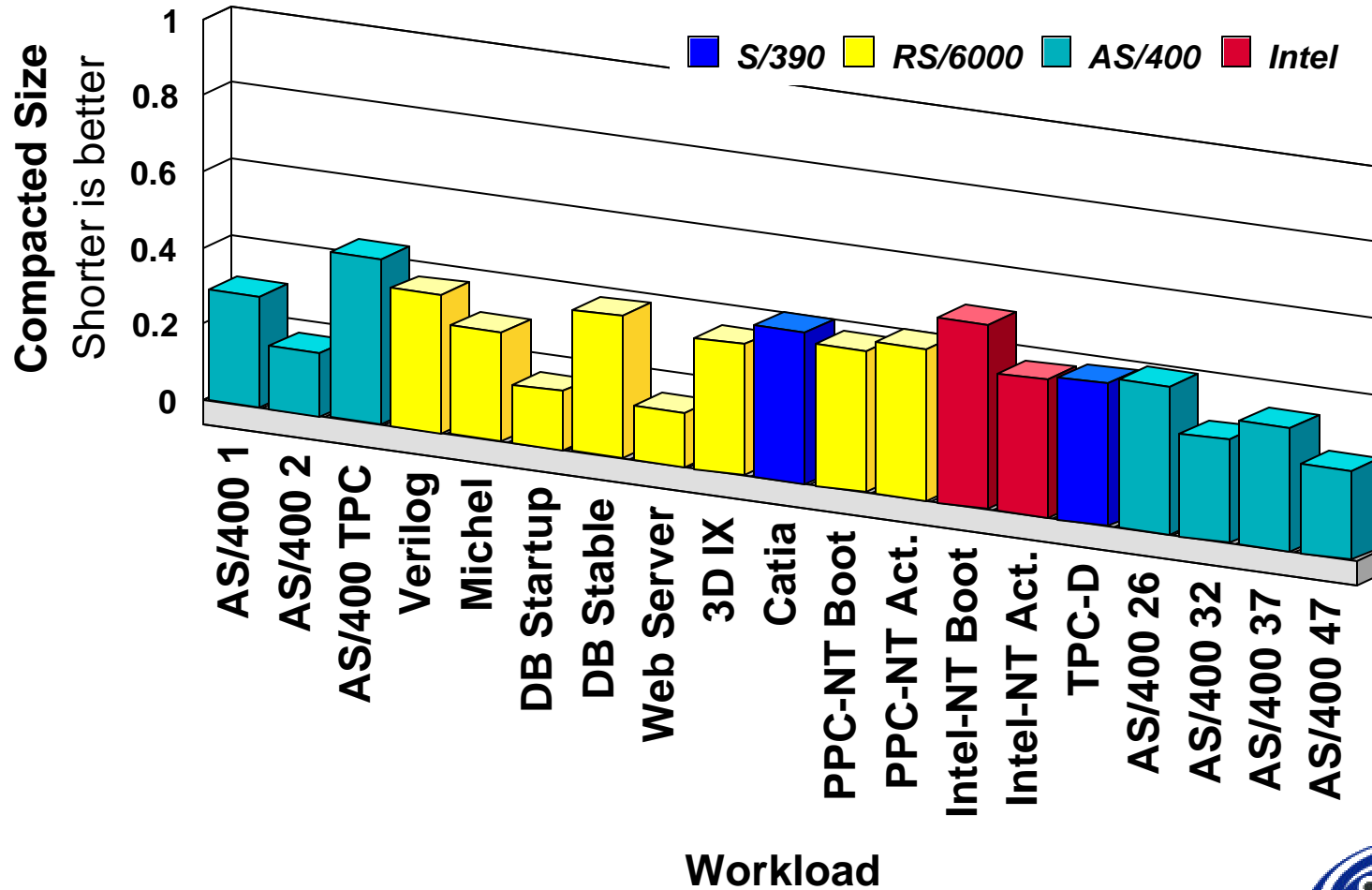


- MXT has its roots in tried and true data compression algorithms
  - LZ as used in the popular pkzip
  - Efficient and non-lossy
- Replaces replications of strings with short pointers to parent copy
- Patented parallel configuration of 4 engines reduces write and read latencies
- 1K Real memory blocks allow random access to data
- Fast bypass of L3 reduces read latency
- Variable sized MXT blocks are stored physical memory
  - Blocks vary in size from 16 bytes to 1024 bytes
  - Innovative hardware memory management stores variable sized blocks
- Patented CRC mechanism protects data from corruption



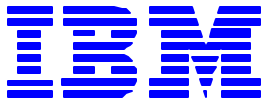
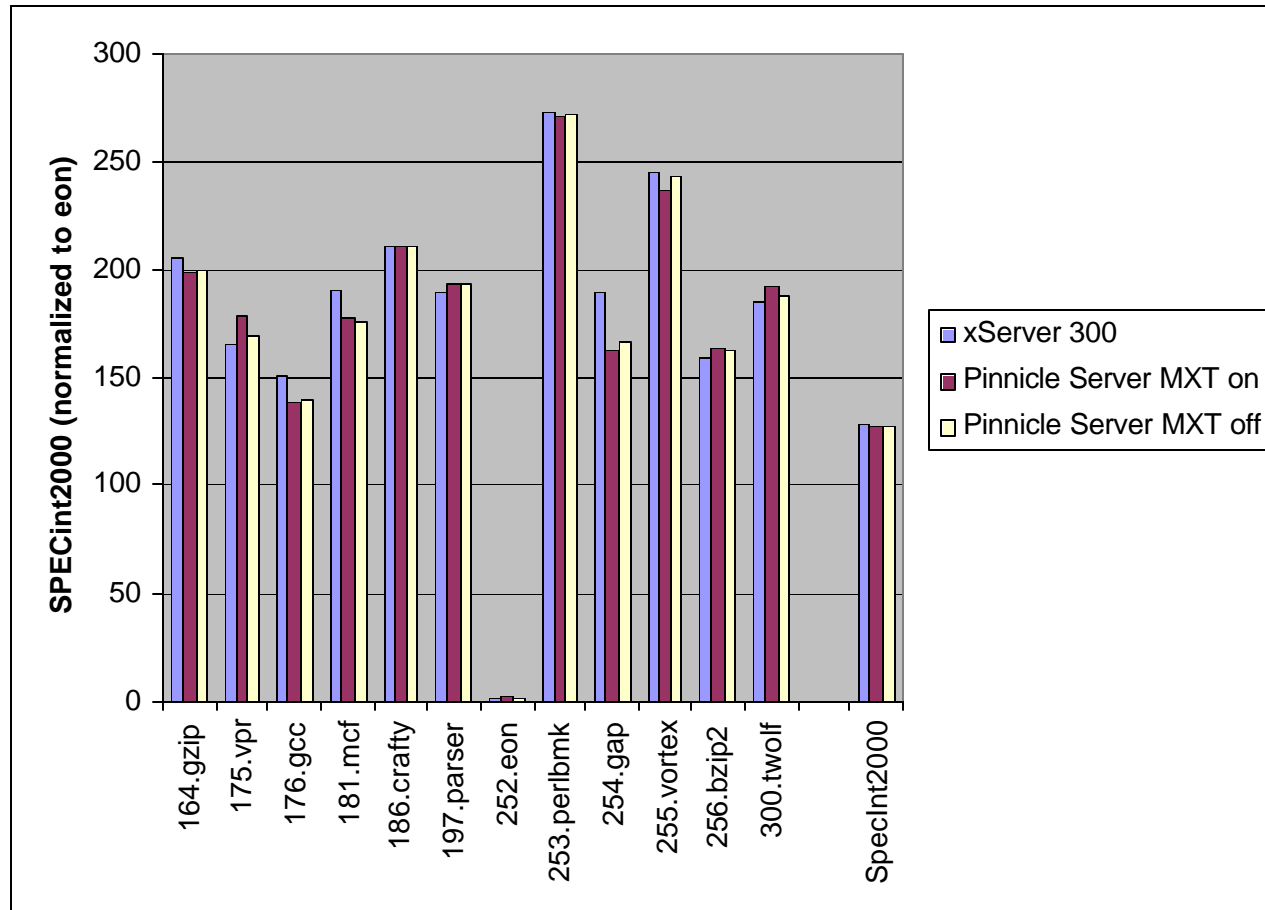
# Memory eXtension Technology (MXT)

## Real-World Memory Savings



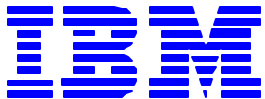
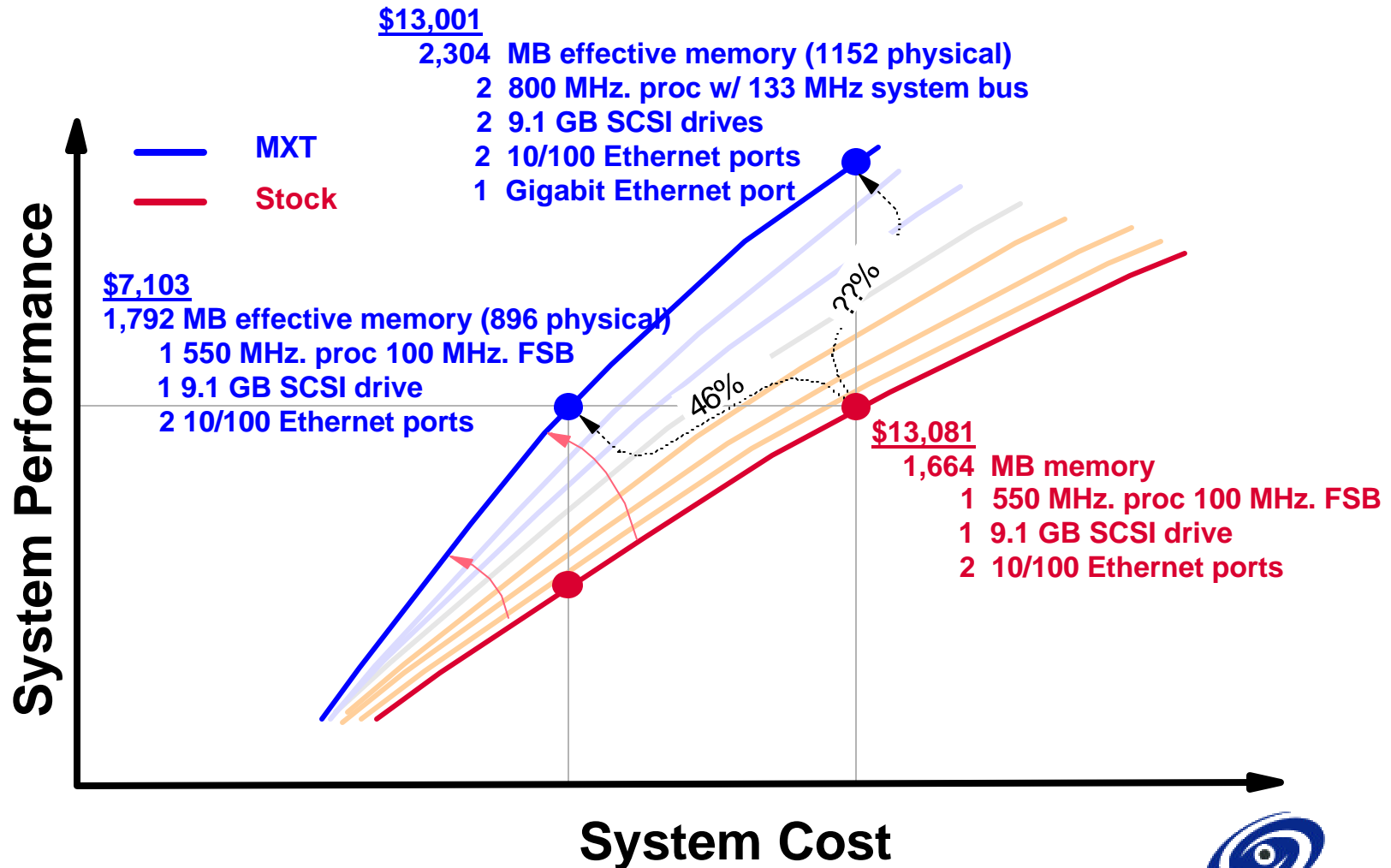
# Memory eXtension Technology (MXT)

Performance Comparison of ServerWorks CNB30LE and Pinnacle  
Intel PIII 733 (256K L2), 512MB Systems, SPEC CINT2000 Benchmarks



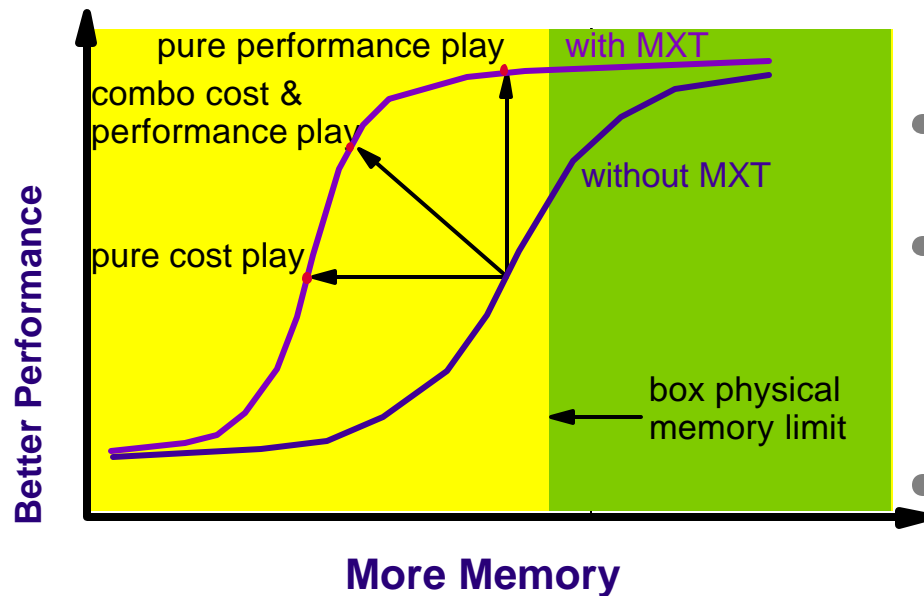
# Memory eXtension Technology (MXT)

## System Cost Leverage

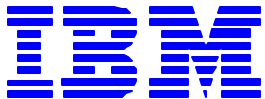


# Memory eXtension Technology (MXT)

## Conclusion

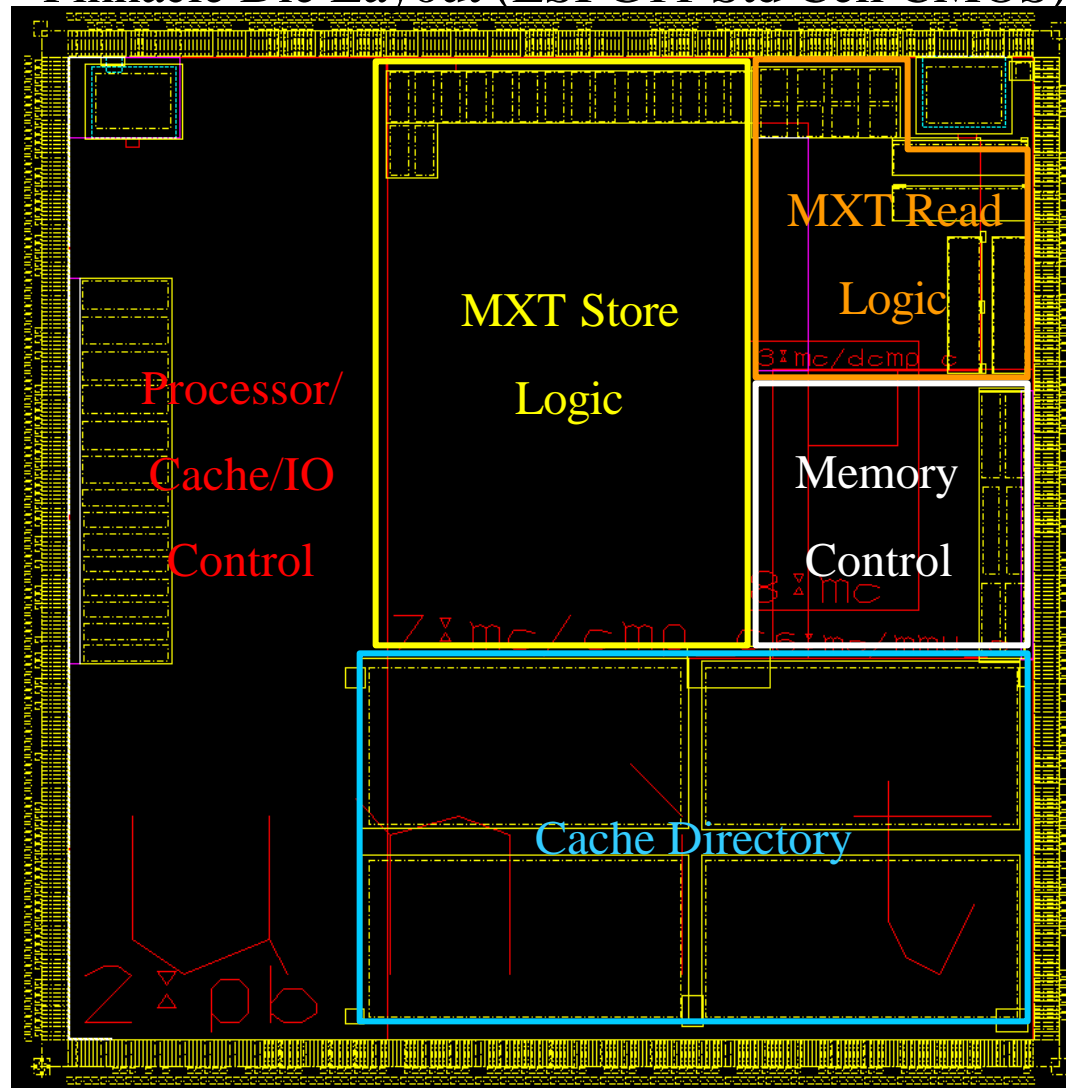


- Proven technology that empowers consumers to efficiently utilize their memory investment.
- Logical step in the effort to improve server price/performance
- IT professionals routinely save \$1000's on systems ranging from High density servers to large memory enterprise servers
- Technology well suited to other memory intensive applications too (disk controllers, laptops, etc.)



# Memory eXtension Technology (MXT)

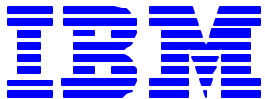
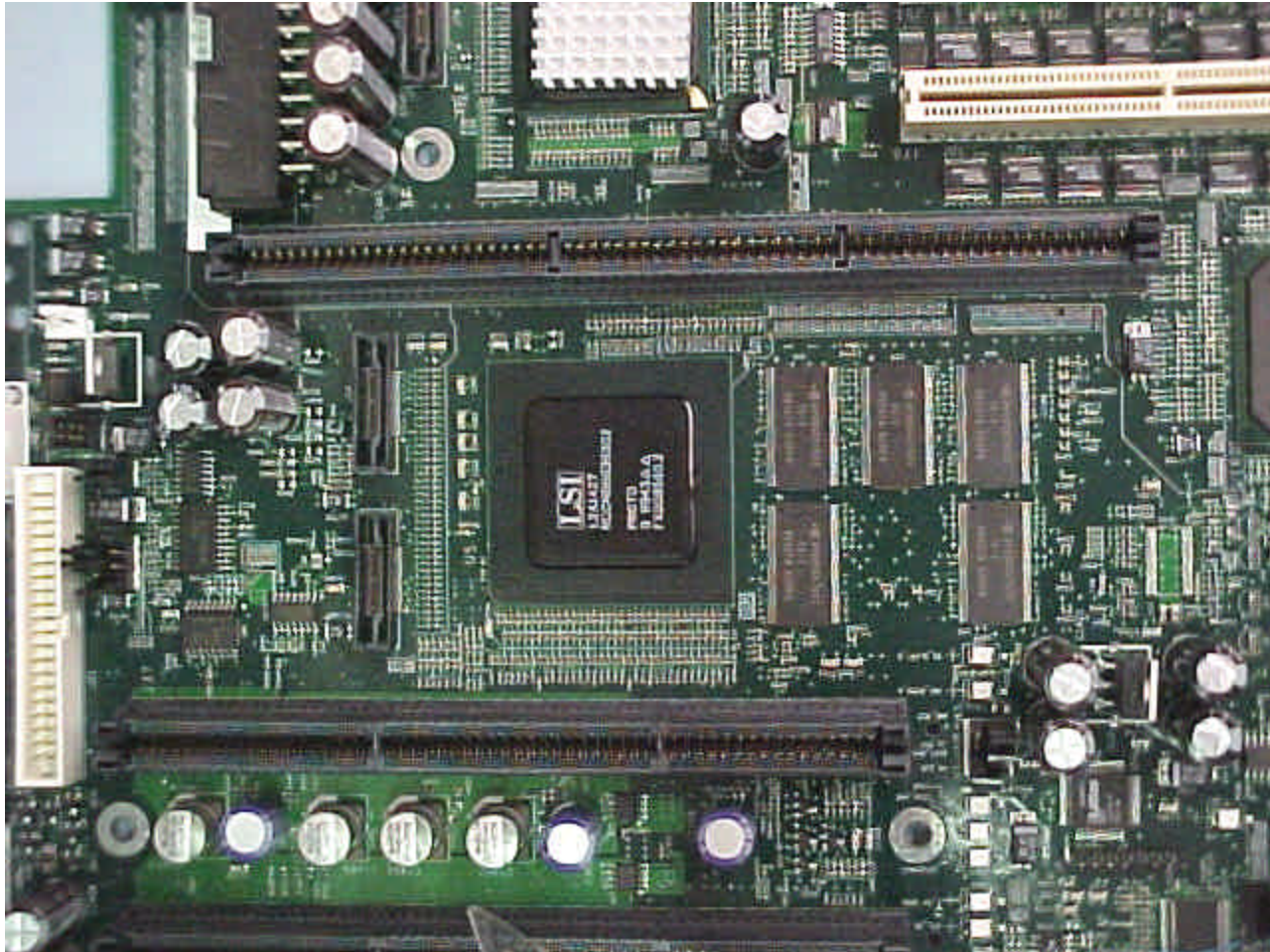
Pinnacle Die Layout (LSI G11 Std Cell CMOS)





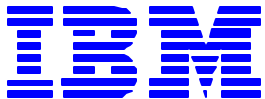
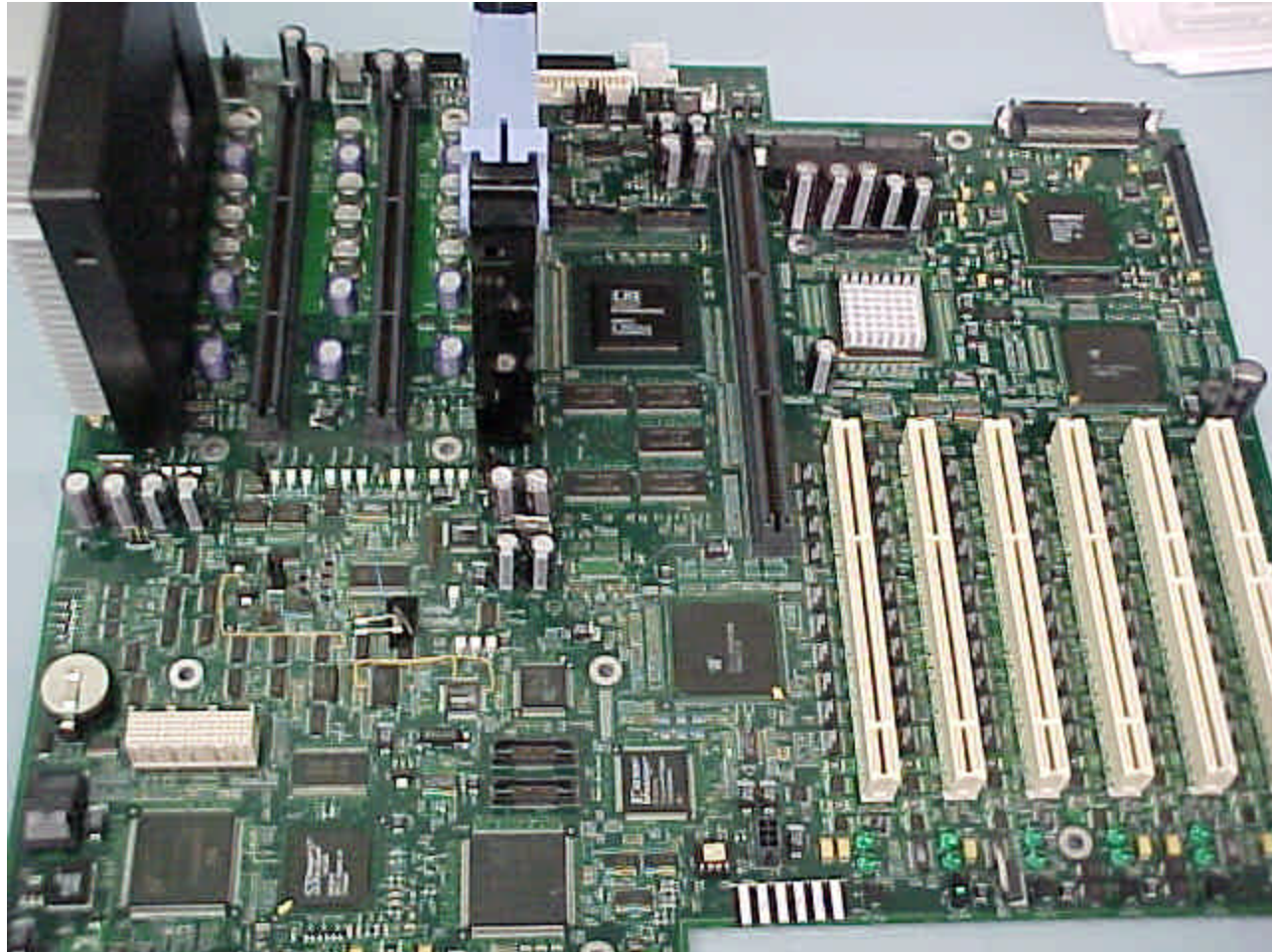
# Memory eXtension Technology (MXT)

Pinnacle Chip and Cache Memory



# Memory eXtension Technology (MXT)

4-Way Xeon Server Mainboard





# Memory eXtension Technology (MXT)

2-Way “Coppermine” Server Mainboard

